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ABSTRACT

Institutions of higher education must find ways to develop the expertise needed to teach in the online world. Rather than address the technology as a separate set of skills that can be addressed separately through workshops, this paper makes the case for approaches that consider how course content, pedagogical values, representations, and technology constrain each other in an online course. The paper describes the approach used in a course that teams senior education faculty and educational technology graduate students to design online learning environments. Six teams of one faculty member and three or four master's students worked on designing an online course. Results are presented from observations, surveys, and Web-site revisions to paint a portrait of the faculty and graduate student experiences. Experienced in teaching face-to-face, faculty members had to consider many ideas when their teaching practice was confronted with new technologies. They examined implicitly held beliefs about their teaching (content, pedagogy, and representation), became familiar with a number of technologies and their uses, and the constraints among technology, content, pedagogy, and representation. Graduate student co-designers also became more experienced with new technologies, but for many of them, it was also a look at how faculty members think about and negotiate relationships between course content and pedagogical representations. The paper concludes with a case study that portrays how one design group progressed through the design process. Appendixes contain the faculty and student surveys. (Contains 18 references.) (Author/SLD)

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With a Little Help from Your Students:
A new Model for Faculty Development and Online Course Design

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ABSTRACT

Institutions of higher education must find ways to develop the expertise needed to teach in the online world, Rather than address the technology as a separate set of skills that can be addressed separately through workshops, we argue for approaches that consider how course content, pedagogical values, representations, and technology co-constrain each other in an online course. We describe our approach in a course that teams together senior education faculty and educational technology graduate students to design online learning environments. We present results from observations, surveys, and web-site revisions to paint a portrait of the faculty and graduate student experiences. Experienced in teaching their courses in a face to face environment, faculty members had to consider many ideas when their teaching practice was confronted with new technologies – they examined implicitly held beliefs about their teaching (content, pedagogy, and representation), became familiar with a number of technologies and their uses, and the constraints between technology, content, pedagogy and representation. Graduate student co-designers also became more experienced with new technologies, but for many of them, it was also a look into the window of how faculty members think about and negotiate relationships between course content and pedagogical representations. We conclude with a case study that portrays how one design group progressed through the design process.

In the fall of 2001, Michigan State University began offering a Master's degree program available entirely online. In order to prepare university faculty to meet the demands of teaching and learning in an online environment, institutions of higher education, such as Michigan State University, must find ways to develop the expertise needed to teach in the online world, while meeting several very real constraints (e.g., limited faculty time, limited college budgets, fear of technology, etc.). Furthermore, universities making large-scale financial commitments to an innovation, like Internet-based education, are concerned with the successful diffusion of their investment. Current diffusion theories note the importance of developing opinion leaders and the essential role they serve in the adoption of an innovation within a social system (Rogers, 1995).

Faculty members who teach the online courses are key to the implementation of a quality online program. However, faculty who are accustomed to only thinking about teaching and courses in a more traditional face-to-face classroom, are often reluctant (at best) to tackle the job of teaching through a technological medium. Research in the area of faculty development indicates that attitudinal issues, such as how people perceive and react to technologies are far more important than structural and technical obstacles in influencing the use of technology in higher education (Dillon & Walsh, 1992; Clark 1993). Moreover, course preparation and development often require extensive investments of time, something most faculty find burdensome (Harris & DiPaolo, 1999; Loeding & Winn, 1999).

In addition many faculty members are reluctant to learn the details of working with technology. They often believe that learning technology would take time (a limited resource) away from thinking about pedagogy. This perspective treats technology and pedagogy as if they existed in separate conceptual worlds with little, if any, interaction with each other. Unfortunately, those charged with helping faculty become fluent with technology often fall into the trap of treating technology as a separate issue, by providing faculty development (workshops, etc.) that treat the technology as a skill to be picked up by the faculty as a whole, who will then know what to do with the skill in their respective areas of expertise and teaching.

We argue that traditional methods of technology training for faculty, mainly workshops and seminars (voluntary or mandated) and courses, are ill-suited to develop deep understanding of the relationships between the technology and

pedagogy that come together in effective practice. In short, there is no technology concept that applies for every teacher, every course, or every view of teaching – course content, pedagogical practices, domain representations, and technology all co-constrain one another.

A Transactional Model of Effective Online Teaching

We argue that successfully integrating technology into a learning environment, including online courses, requires the cooperative interaction of four key components that dynamically constrain and interact with each other (Figure 1). We see these four components as the four vertices of a tetrahedron. The bottom triangle (the foundation so to speak) of the tetrahedron is formed by the triad of issues: content, technology and representation.

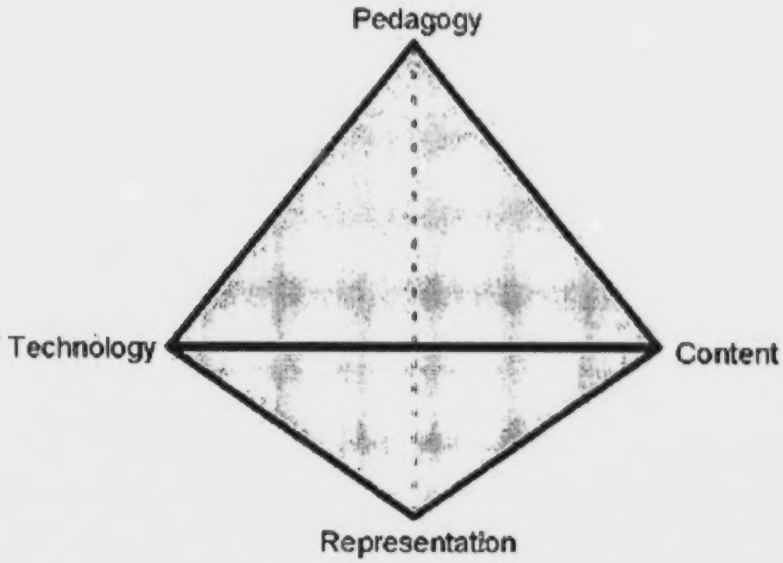

Figure 1. Four components to successful integration of technology in teaching.

This model forms the basis for how we think about technology in teaching in general, and in particular, how we think about developing faculty to teach online. Each of the elements and their relationships are elaborated below.

- **Content** - By this we mean the actual subject matter that is to be learned/taught. Clearly the content to be covered in high-school social studies is very different from the content to be covered in a graduate course on political science. In the case of a particular course this would mean the core ideas, knowledge, procedures, and resources (reading lists etc.) that make up the course.

- **Technology** – Our view of technology is broad, encompassing standard technologies such as books and chalk and blackboard, as well as more advanced technologies such as the Internet and digital video.

- **Representation** – By representation we mean the manner in which the knowledge to be covered (the content) is instantiated and presented (using the constraints and affordances of the technology). This would mean anything from text to multimedia, graphs and charts to mathematical notation. Clearly, representation of content is closely related to the technology being used.

- **Pedagogy**– Content, representation and technology have to come together to inform pedagogy. By pedagogy we mean the process of teaching and learning and it encompasses (among other things) overall educational purposes as well as issues related to techniques to be used in the classroom, understanding and evaluating student learning and so on.

We must add that separating out these four key issues is an analytic act and one that is extremely difficult, if not impossible, to tease out in practice. In actuality these four exist in a state of dynamic equilibrium, or as the philosopher Kuhn said in a different context, in a state of "essential tension" (Kuhn, 1979). The traditional view of the relationship between these four aspects would argue that most decisions would be driven by the "apex" of the tetrahedron: the pedagogical goals. However, things are rarely that clear cut, particularly when newer technologies are being used. Technologies often come with their own imperatives that determine the kinds of representations and content that has to be covered. This in turn can affect core pedagogical issues. The advent of online education at our university and elsewhere can be seen as an example of technology and other social pressures forcing people to confront these issues. So in this context it is the technology that pushes the other three "vertices" to rearrange themselves.

Decisions about any one of these elements has implications and consequences for all three. For example, teaching mathematics (the content) would drive the kinds of representations to be used (symbolic representations such as equations or visual representations such as diagrams). Likewise, these representations would require certain technological tools to allow students and instructors to display and manipulate the representations. It may even cause the student to change the technology they use to view the content (the need for some form of browser plugin if this course were being offered via the Internet). If, on the other hand, the technology currently available would not support the writing of equations it would lead to a shift both of representation and content and thus pedagogy. Consider another example, if the course content is about learning simple facts about the properties of each of the periodic chemical elements, then some pedagogical representations (e.g., essays) are not as attractive. Likewise, a course about film might require certain technological tools (like video). These interactions go both ways, deciding on a particular technological tool will offer constraints upon the representations that can be developed, the course content that can be covered and delivered and thus the pedagogical process as well.

Thus our view sees teaching and learning with technology as existing in a transactional relationship between these four factors. A change in any one of the factors has to be "compensated" by changes in the other three. This dynamical relationship between these four factors lies at the heart of design.

We believe that these four components or aspects are key to all teaching. However, when we talk about traditional face to face courses, these issues often remain in the background. This is because with years of practice and familiarity we have developed a series of pedagogical scripts that allow us to function without reflection. The content seems tried and true as do the kinds of representations we use. In addition the technologies we use become invisible—in that, we often do not consider them as being technologies at all.

The addition of a new technology or a new medium often changes the relationship between all four elements. A key new medium, and one that we are concerned with in this paper, is that of online education. The relative newness of the online technologies forces faculty members who are developing online courses to deal with all four factors at the same time—something they may not have done in a long time. The addition of a new technology often raises fundamental questions about content, representation and pedagogy that can often overwhelm the faculty member.

In this situation it becomes important to develop better ways of helping and supporting faculty members as they develop and teach such courses. We believe that most traditional techniques for faculty support fall short of the mark. Later in this paper we shall present, what we call, the design approach towards faculty development. We argue that this approach is well-suited to having faculty members develop and appreciate knowledge of these interactions. Before we do this, however, we would like to review the "standard" model of faculty development followed at our university (and we suspect at many other institutions of higher education as well).

The Standard Approach

Many institutions will enlist the aid of technical experts (e.g., web-programmers) to simply render courses in an online format, leaving the pedagogy to the experts in their chosen fields. At Michigan State, the university has developed a special unit (the Virtual University) for supporting faculty members in this regard. The model they follow is represented in Figure 2.

Figure 2: Virtual University Model for supporting Faculty in Developing Online courses

Faculty members are responsible for developing the content of the course while the VU staff, consisting of designers and programmers develop the technology required. Currently the VU staff have developed a series of software modules (called "widgets") that can be integrated into different courses. These widgets include a discussion board, chatrooms, file uploading facilities etc. Interaction between the faculty members and the designers and programmers is through the "Producer," also an employee of VU. The producer is the key person in this equation who takes the ideas developed by the faculty member and instantiates them using the tools made available by the technical staff. However, the producers rarely, if ever, have backgrounds in education or instructional design. And yet, they are charged with helping faculty to re-configure their ideas to match the tools available.

Our critique of this approach stems from the transactional model presented above. We believe that four elements of online teaching (content, representation, technology, and pedagogy should be designed co-jointly. In the VU approach, this is not the case – the course content is developed by the faculty, while the technology (widgets) are designed by the programmers. Hence they are "fixed", and often constrain the kinds of representations possible. The VU producer is put in a difficult spot – they must figure out how the two halves of the tetrahedron fit together without much expertise in thinking about pedagogy, and only minimal guesses about what the faculty member likes to do in a more traditional class or ideas about what they might like to try in the online version.

As a consequence, course quality is likely to suffer. Since the faculty members often lack sufficient knowledge of the technology and its possibilities they are constrained by what is offered to them by the producer. We believe that leaving these design decisions to the producers and other technical experts can have a significant impact on the pedagogy. Form and function are intimately related and we believe that faculty members need to be the ones making these decisions. Unfortunately, in the VU approach, the producers may end up making decisions that have unintended pedagogical consequences. In addition the faculty who are the pedagogical experts, since they are unfamiliar with the technology may not recognize the subtleties of how technical decisions can affect pedagogy.

Faculty members also get short-changed, they never get to experience the interaction of the technology with content, pedagogy, and representation. Thus, they do not gain a knowledge about what goes on inside that black box, nor do they have opportunities to learn how course content and pedagogical representations co-constrain the technology and vice versa. Further, in the VU model, the technology is often taken out of the faculty members' hands, particularly if they are not intrinsically interested in learning about it. Ironically, this lack of a need to learn about the technology is often touted as being the main value of having the producer.

Another consequence of the VU model is that it leads to uniformity and the one-size-fits-all approach towards course development. Most VU courses look like clones of each other. Institutional practices get stabilized as producers present incoming faculty members with existing online course designs and since the faculty do not know better, they continue to replicate what has "worked before." Again, we believe that different course content should lead to different representations and technologies. It is our experience that courses taught face-to-face often differ drastically from each other when taught by different faculty members and even when taught by the same faculty member at different times. Instructors bring their personality, their individuality to the course, its presentation, and its execution. However, the individual faculty member is often missing from the presentation of the course, or at best delegated to a corner of the web site (the corner that contains the mandatory instructor's picture and bio). What is lost is the variety, richness and

individuality that faculty members bring to the course. That is, the VU model somehow loses track of how course content affects the overall design.Finally, the VU model takes faculty development as being the last stage in the process. The faculty, rarely, if ever, get a chance to play with the technology and the online course options before they get to teach it. For the faculty, first time is real-time, throwing them into the teaching of the online course without offering them a chance to reflect on the process prior to teaching it.

To the Rescue: Our Design Team Approach

Menges (1994) lists the different standard approaches that have been found to be successful for faculty development. These are (a) workshops and seminars; (b) individual consultation; (c) grants for instructional improvements; (c) resource materials, such as books and newsletters; and (d) colleagues helping colleagues.

Rather than use any single of these approaches we decided to do all of the above and more through what we call "learning by design." Instead of handing the web-programmers a set of materials that worked in the face-to-face classroom, we advocate that the expert teachers take a hand in the design of the technology to support the learning. We rely on the process of design to develop the necessary skills and relationships for understanding the nuances of integrating technology and pedagogy. That is, the design approach attempts to make faculty members fluent in negotiating the interactions between pedagogy, content, and technology by developing their competencies with technology, and by giving them experiences with the interactions of the three components (technology, pedagogy, content).

Our emphasis on design has been informed by long-standing research on the use of design for learning complex and interrelated ideas (Dewey, 1910; Perkins, 1989; Blumenfeld et. al. 1991; Brown, 1991; Harel & Papert; 1990; Kafai, 1996). Design-based activities not only provide a rich context for learning, they also lend themselves to sustained inquiry and revision that we hope will help designers to come away with the deep understanding needed to apply knowledge in the complex domains of real world practice (Mishra & Koehler, in press).

At Michigan State University, this design approach is represented in an educational technology Master's level course. In this course, master's students enroll to learn how to design technology to help solve a problem of educational practice. During the Spring 2001 offering of the course, six tenured faculty were enrolled as "students" in the design course. Teams consisting of one faculty member and three or four master's students worked on designing an online course that would be taught by the faculty member in the following year. The major activities of the course consisted of readings, explorations with technology, prototyping of the online course, online and in-class discussions, and peer review and feedback. A typical class period had a whole group component that was used to discuss readings and issues that applied to all groups, and a small group component in which the design teams worked on their projects.

A range of incentives were offered to the various groups in the class. The faculty received a laptop computer and $1000 for developing the course. They could keep the laptop once the course was over. The faculty, however did not receive any course buyout or overload pay for this work. Of course, the opportunity of working with other faculty members and graduate students was also an incentive. For the students it was an opportunity to work with faculty members on an authentic project, to learn about educational technology and online teaching and learning, and to earn 3 more credits towards their final degree. For us, the instructors of the course, it was an opportunity to build on our

research agenda on learning through design. It allowed us to take our ideas about methods for developing technological proficiency in educators (Mishra & Koehler, in press; Mishra, Zhao & Tan, 1999), and test the approach in the realm of developing online courses.

Why design?

Often design is seen as being embodied in the final product. Additionally, design is seen as the offering of cosmetic changes to an artifact that has been engineered. Design is also seen as the mere application of scientific problem solving, what Schon (1983) calls the myth of technical rationality. In contrast to this we offer design as being a process that is spontaneous, unpredictable, messy, creative and hard to define. We see it as being a dialogue between constraints and tradeoffs and a process that does not offer easy solutions. The best we can hope for is, in Herb Simon's wonderful phrase, "satisficing" (Simon, 1968). Design (like teaching) is as much an art as it is a science. Dewey had said that psychology is a science, teaching is an art (Dewey, 1920). We would add design to the above quote as well. For the purpose of creating online courses, this means using design to have faculty and students experience and appropriate the art, science, and psychology of the tradeoffs of constraints between content, pedagogy, and technology.

We also see design as appropriate for learning about any of the individual components (technology, pedagogy, content, representation). Take, for example, technology as a factor of teaching and learning. What should teachers and faculty know about technology, and how should they be expected to learn it? Much has been written about the matter, but we have a different take. We see technology proficiency as being at three levels: (a) mechanical; (b) meaningful; and (c) generative. Users at the mechanical level can use technological tools however they are often constrained by their limited understandings of particular pieces of software. They think of tools as being useful for single tasks, such as Eudora for email and the web for browsing. At the next level, users develop a better and more complex understanding of the nature of tools and purposes. At the generative level, users can re-purpose tools for their own needs and feel less constrained by what is offered to them. They become more goal driven as opposed to driven by what the tools offer them. Clearly we believe that users (and teachers in particular) need to reach the generative level of technology use. We see this as happening by their achieving fluency through use in authentic contexts and through authentic problems. By emphasizing design we attempt to immerse teachers and educators in thinking deeply about how artifacts (such as online course websites) are produced.

METHODS

We were interested in studying the outcomes from students' and faculty's participation in the course. Of particular interest was the extent to which participants became increasingly adept at navigating the relationships and constraints of the four elements of the transactional model.

For this study we collected a range of data. Throughout the semester we collected data from the normal course of the class, including postings made to the discussion groups, emails, artifacts created by the groups, our own observations, and final papers that asked students to write about their reflections on the course. Specifically, their paper needed to address: their thoughts on learning in design teams, what they learned about technology, pedagogy, design, and other issues related to online learning, and their recommendations for future instantiations of the course.

At the end of the semester, students completed a short email survey and faculty were interviewed face to face. The hour long interview asked faculty to reflect about their experience in the design process. The interview was designed to address each professor's struggle with transactions between technology, pedagogy, content, and representation. Also, we wanted to look at how group dynamics affected the development of the course. Appendix A contains the questions used in the interview. Students responded to similar questions via an email survey after the class was over (see Appendix B).

We used several sources of data to write a case-study of the group we knew the most about. The analysis for the case study was based on information collected from progress reports, group postings, email interviews with the students, an in-depth interview with the instructor, the students' reflection papers, and a chronological analysis of the development of the course website. Initially, we read through all of the data and drew out recurring themes. These themes were discussed among all of the group members. We then went back and wrote a chronological narrative of the development of the course. At the same time we focused on how the important themes developed, came to the forefront, and receded into the background. The process of analyzing the development of the course was iterative – we continually revisited our analysis based on feedback from other members in the group.

RESULTS

Our experience has shown that the scenarios enacted by each group has some common elements, yet varies widely depending upon the course (content), the faculty member (pedagogy), and the students (and their technological background). Common to each individual were opportunities to learn and acquire technological proficiency. These opportunities to learn were utilized to varying degrees for each student.

Common to each group were various episodes of grappling with the interaction of content, pedagogy, representation and technology. As a whole, these episodes constitute a number of distinct stages that characterize the progress of the design team. In the first stage, a group struggled to get started, they would struggle to find roles for individual members, determine realistic goals, and struggle towards their first design. The second stage is characterized by individuals settling into roles, allowing the group to get in flow and wrestle with the important issues of where technology, content, pedagogy, and representation meet. In the final stage, groups had a chance to wrap up their work, integrate different parts of their course to fit together smoothly with the other courses, or work on a problem of particular interest to the group (shaping initial student experiences, better graphical layout, etc.). Each group spent a different amount of time in each stage, yet, they progressed through each stage throughout the course.

In the sections that follow, we sketch a picture of what the process was like for the participants, and what individuals learned. At the level of design group, we present the story of a representative group led by Dr. Shaker. After which, we present general outcomes for students and faculty members who participated in the design course. Rather than report summative statistics, we present the main ideas that came out of this experience that are supported by data sources (usually quotes from interviews).

Understanding the Design Groups: A Case Study of Dr. Shaker's Group

Dr. Shaker, a tenured faculty member in the School Psychology program, took the class "to really give myself, force myself the luxury of thinking critically about teaching in, in this format and in any other format. That was really a luxury of the course and that's what I wanted."

Dr. Shaker held a fairly common view about technology – that the details are unimportant for teachers:

> I don't know a lot about the technical stuff of the computer. I don't feel like I want to know that, or need to know that.... I don't need to know how to compress stuff and, you know, other people can do that. That's not what I wanna do. I don't know how the telephone works either. Nor do I care. (Dr. Shaker, interview)

In the group with Dr. Shaker were three graduate students, Clark, Pat and Xi. These three students had very different backgrounds, interests and knowledge of technology. Clark was a student in the Master's program in Educational Technology and this was his last course for the program. He had been looking for a cumulating project, in his final paper he wrote "... my focus for this project was to consolidate all of the ideas into one place and create a reference site that would be helpful to others, and to myself, to go back to after the course was done and have some legacy of the process during the Instructional Design program." Pat was a graduate student in Student Affairs Administration and was looking for a project that was related to his area of study. As he wrote, "... initially I was somewhat disappointed with the material that I would be developing. I have no real interest in secondary education discipline theories. It did not take me to long to realize that the content of the course was not the important part of the group process. Finding a way to translate Dr. Shaker's pedagogical style to the web was." Xi was a doctoral student in Educational Psychology and saw this course as being a "fun and new experience."

From the final papers, it was clear that all the group members expected to learn technology (though to varying degrees). The fact that the structure of the course did not include too much direct instruction on technology, or provide examples of best practice, bothered the participants somewhat. As Dr. Shaker said, "I would've benefited, I think, had I had some exemplars or models earlier in the course. We talked about this with Matt and Punya and they made a design decision not to expose us to that because they didn't wanna limit us, our thinking, too early."

Stage 1: Getting started. All the groups in the first stage wrestled with how to get started. From our observations, this initial struggle has two components: getting started as a design team (defining roles, learning to work together, etc.), and deciding what an online class should be.

Thrown together for the first time, the groups had to face the struggle of finding a model for them to work together. The faculty were unclear as to how much direction they were supposed to provide. They were often unsure of their knowledge of the technology and what they could expect from the students in their groups. As Dr. Shaker said,

> "These guys know so much about how to do stuff that they were kind of waiting for me to give them direction and this is where I said I tried very hard not to control the group because I didn't feel like I could provide direction early on in the course. I was clueless. And so they were really instrumental in going, well, let's try this. Let's play with this idea and see how it works."

The other struggle was how to start developing an online course – the majority of faculty had never taught online before, and Most of the students had not taken an online course before. Dr. Shaker didn't really know what was likely to appear:

> "Even though I'd kicked these ideas around with my husband, I never really thought seriously about how would I teach online. This was my first opportunity to really do that. And I didn't have a clue, not a clue of what was possible. And so I felt like I lost about 5 weeks at the beginning of the semester because I was clueless."

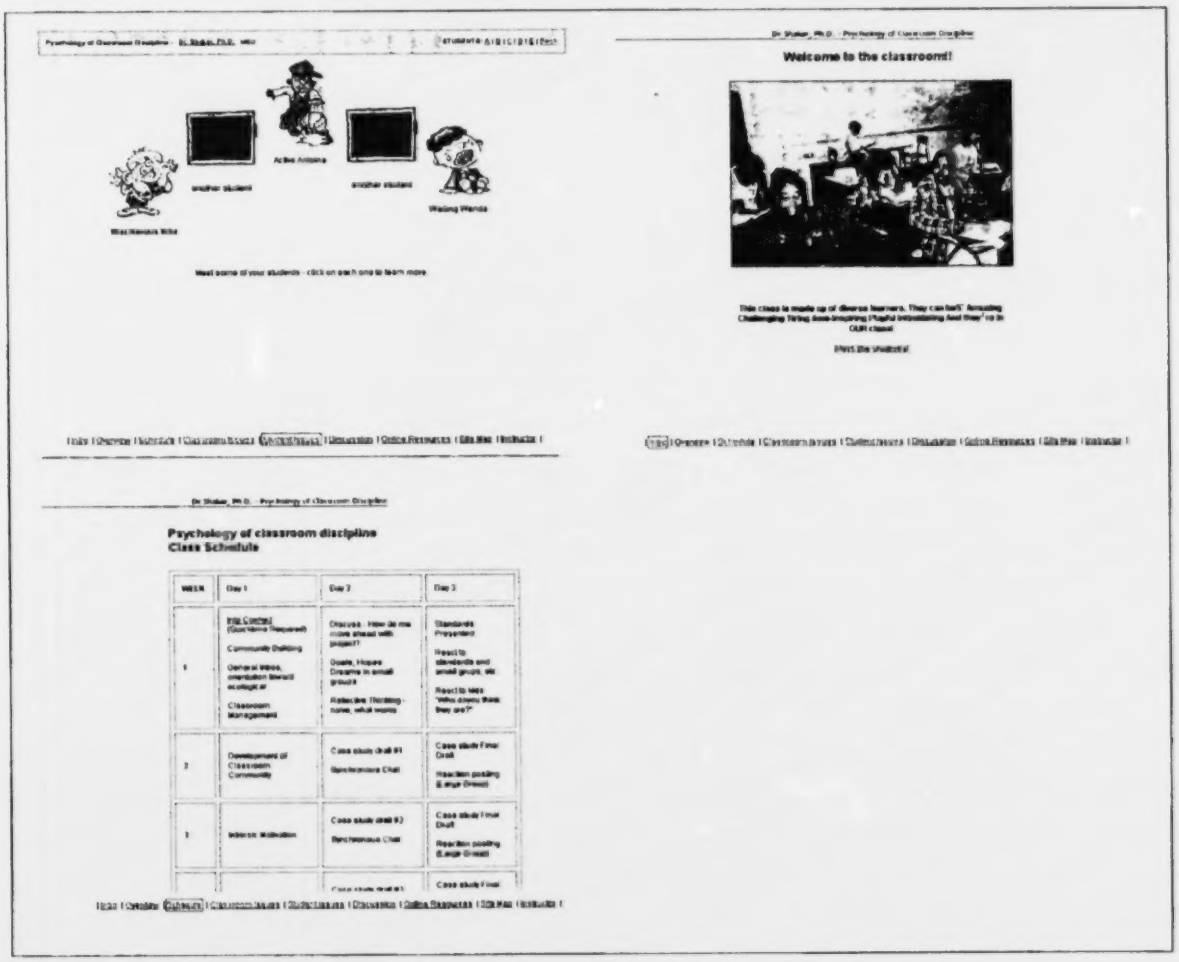

Figure 3: First website created by Dr. Shaker's group

This impasse was finally broken about 5 weeks into the class following a series of group brainstorming sessions for the overall format of the course. Dr. Shaker described the course as she had taught it in face to face situations. However, since the dynamics between technology, pedagogy, representation and content were affected by the online

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environment, the group experienced a difficult struggle with how to begin representing ideas and concepts in this new environment. Clearly this was something frustrating for the students as well. It was at this time that Clark stepped in and created the first mockup site. As Dr. Shaker describes it,

> "...we sat down and I did some storyboarding one day in class and we sat down and we kind of brainstormed some ideas about what it might look like and I said things like it should have a nice, light feel because it's a summer course and then he went away with it and kind of did a mock up that was fabulous."

As Figure 3 shows, the first version of their website was simple, playful, incomplete, inventful, and otherwise representative of a first draft. Having a first site, however, incomplete and incorrect as it may have been, galvanized the group. It gave them something to critique and think about. Pat and Xi along with Dr. Shaker began to think of the timeline of the course. Dr. Shaker wanted this course to be half as long as her regular course. As Pat wrote, "One of the first things we tried to establish was how to take 16 weeks worth of material and make an 8 week online course out of them. 8 weeks is no time at all. In the end we designed a "three lesson" table."

Stage 2: Solidifying roles, and grappling with the issues. By this time, most groups, either explicitly or implicitly, had solidified the roles and responsibilities for group members. Most groups had a "technology expert," who had a strong enough background in technology to know how various technology tools could be used to represent the content. In the case of Dr. Shaker's group, Clark became the webmaster, taking the ideas from the group and creating newer versions of the web site. Pat had taken on the role of the "teaching assistant" thinking through the pedagogy and structure of the content. Xi on the other hand, provided the student perspective and also offered help as and when needed. Clark and Pat clearly took on leadership roles though in different and non-overlapping areas. As Pat said,

> "Our group was diverse in its' strengths. Dr. Shaker was the leader, she gave us her vision and helped us to shape it in a way that would make her a good instructor. Clark was a capable and willing web designer who was able to take all of our crazy ideas and make sense of them on the web. Xi brought an international perspective to the group, which was helpful. She also asked several questions along the way about things that the rest of us had not thought of. My job in the group seemed to be to lead us through the process of developing a framework for online learning. I led the group during the discussion of how to translate Dr. Shaker and her materials to the web. Those discussions were interesting."

In addition discussions in the groups (and the class at large) began to center around issues related to the relationship between content, technology and pedagogy. This played out in a number of ways. For example, issues of graphic design became central as groups played with different themes and layouts as they tried to find graphics that fit the content, and the desired mood of the course (a factor in pedagogy). However, the design and the content needed to be carefully synchronized with the technology available and what it would let them do. Specifically, during their discussions concerning the interactions of content, pedagogy, and technology they found that these interactions had an impact on the representation of the content in an online environment. The structuring of the content, changing it from a face-to-face class to an online course also became of concern.

The group also became concerned about building community. This was something that we as instructors emphasized a great deal. There were broader discussions in the class (based on readings that we offered) about the

relationship between participation and community. The various technological tools that allowed participation (chatrooms, bulletin boards etc.) were also explored by the groups. The key issue of how to build interaction was explored from a variety of perspectives: interaction between students and content, between students and the instructor and between students themselves. Issues of community, it seems, are an ideal place to explore where content, pedagogy, and technology interact.

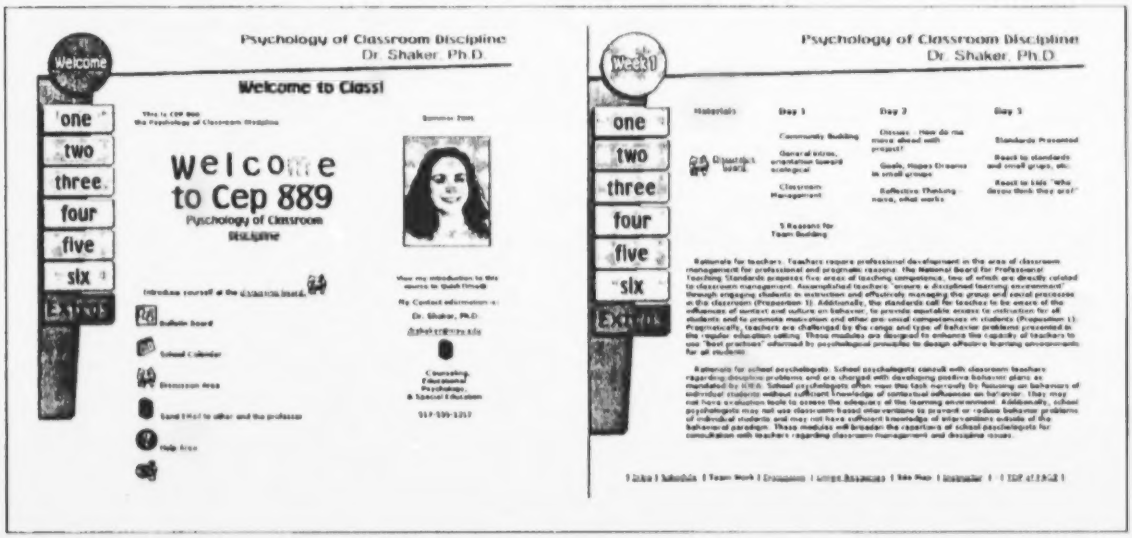

Figure 4: Intermediate version of Dr. Shaker's course

These commonalities are also represented in the experience of Dr. Shakers' group. The website created in the middle weeks of the design (figure 4) highlight their concerns. There were many discussions about the "mood " of the web site and how this could influence student perception and interaction. There were changes in the navigation and the specifics of the timeline of the course.

Stage 3: Bringing it together. The primary concern for most of the groups at this stage was on issues of time management. The faculty members had become intensely concerned, sparked by some of the readings we had assigned, about the amount of time they would have to devote to the online course. There was also increased attention on how to structure initial student experiences since it seemed clear that initial student perceptions would play a significant role in how students interacted and learned in this new medium. These discussions were often reflected in the redesign of the web sites.

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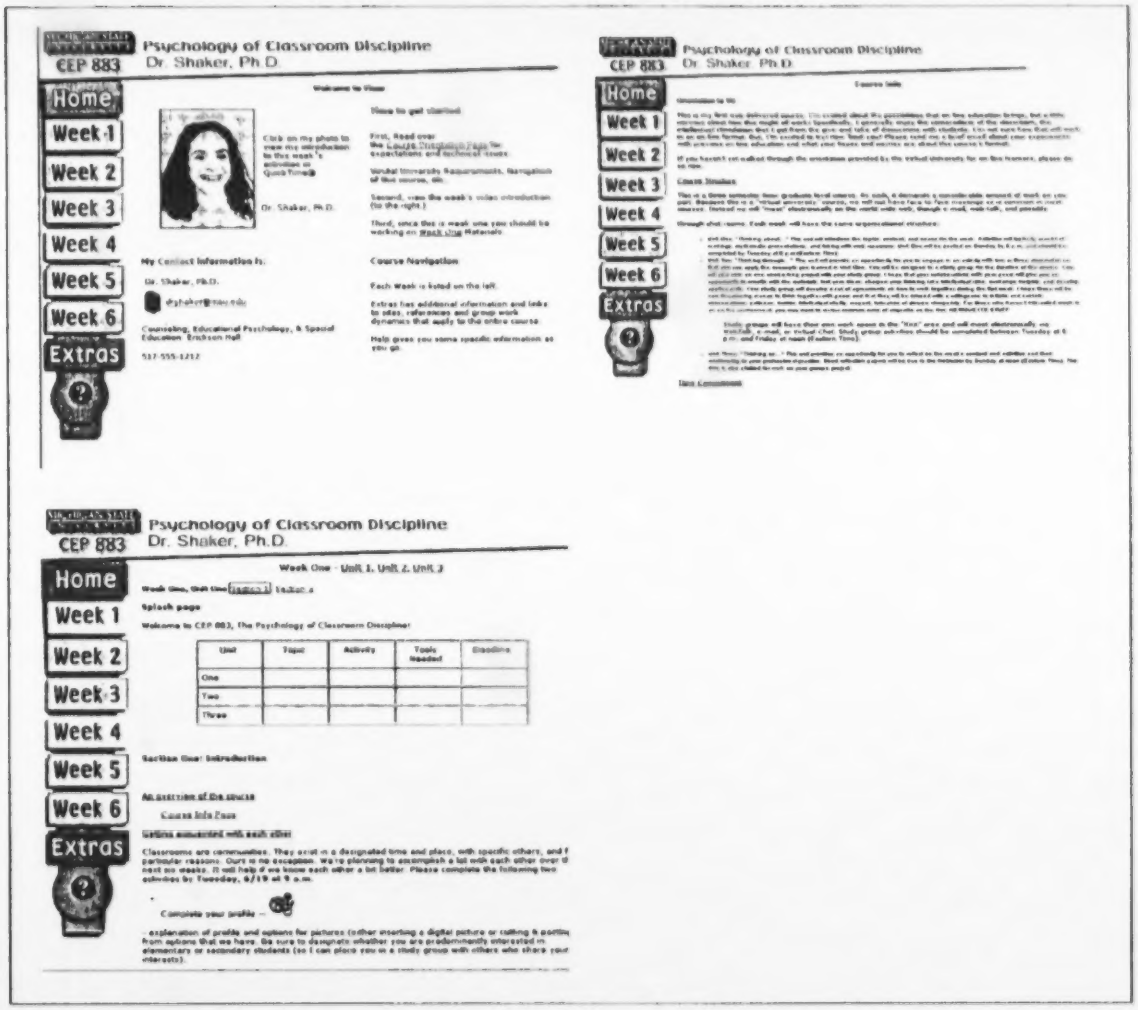

Figure 5: Final version of Dr. Shaker's course

In Dr. Shaker's group, there was less discussion at this stage on the look and feel of the course, the content and navigation, issues that had taken up most of the time in the previous stage. Most of these things had been solidified after multiple iterations and exploration. Most of the discussion and work at this stage were on building expectations for the students and the instructor. There was an increased emphasis on community building with issues such as interactivity and intimacy taking on greater importance. As Dr. Shaker said,

> "I've had to think more carefully about how to build in the kind of collaborative community oriented, and we talked about it as community in the class a lot, aspects that are just a part of face to face instruction… One of the first things they do is fill out their profiles, and I've programmed that to be a little bit more directive about information I want from them. And then each week, I ask them to do something that's self -revealing...So I'm trying to think about how to use again some of the more intimacy of the small group or sort of macro

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intimacy of interacting with me versus the sort of riskier thing of interacting with the whole group and trying to structure it so that they get increasingly more comfortable."

Some of these concerns and discussions can be seen reflected in the latest versions of the web site (see Figure 5).

By the end of the course, Dr. Shaker and the other group members had experienced rich discussions about how interactions between the four critical factors of technology, pedagogy, content, and representation affected the development of the course. At different points in time one or more of the factors would come to the forefront but the discussion would still be contextualized by interactions with other factors.

The Graduate Student Experience

The case study presented above provides a look at what happened at the group level. Also important are the outcomes for the various students in the group. After all, this course should teach them something valuable on the way towards their master's degree. We argue that students learned many worthwhile things towards their degree in educational technology, even though much of what they learned was not explicitly taught.

In many ways, this design course was a typical graduate class experience for the students – they read articles, discussed ideas, and were responsible for meeting course deadlines. However, there were some important differences. These students learned a lot about technology – they were exposed to several technologies, they assessed their usefulness, and used some of them in the design of the online class. In more traditional technology courses, students explicitly learn target technologies as part of the course (e.g. web design, digital video, etc). In contrast, the design approach made learning about technology implicit – students learned about technologies as they needed to in order to fulfill some desired feature of the course they were designing. However despite this "implicit approach" students were exposed to a range of different technologies and managed to focus their attention on particular technologies that were most appropriate for the task at hand. For instance, one student wrote, "This course was a wonderful experience for me, and I gained a lot of new knowledge and information that I found very useful for. The best thing that I learned from this course was about FTP and Digitizing Videos, which was something new that I learned."

The task of designing an online course was a unique opportunity for most students. Most of their experience in graduate education has been as students in graduate courses. For those who had some experience teaching a graduate course, their experience was mainly limited to being a teaching assistant, or enacting someone else's ideas. None of the students had previously had the opportunity to design a graduate course from scratch. Opening up the process of graduate teaching for students gave them the chance to apply their knowledge of educational theory to a real context, and to further their own development as future lecturers, instructors, and professors. As one student said, "This class has been one that I will never forget. From how much work building, maintaining, and revising an on line course is to learning how to work in a group again, this experience has been one that has reshaped many things that I have held to or thought about teaching."

Also, the chance to work with tenured faculty provided novel experiences for most of the students. Too often, graduate students' experiences with their professors seem opaque – they only get to see final products of their thought

processes (e.g., research papers, courses they take, etc.). By working with expert educators, they got to interact with ideas in ways that they are seldom allowed – they worked over a whole semester with these ideas, got to influence the experts' ideas, and apply them to a real problem. As one student said, "Working with a faculty member, as a team to create an online class had been a wonderful experience to me especially in thinking about a particular course structure, it's syllabus, schedule, grading systems, forms, the layout of the web, video presentation about the course." Another said, "It was fascinating to see how the faculty thought about curricular design, teaching strategies, and student learning. As I was concurrently enrolled in HALE core course focused on teaching, learning, and curriculum, I learned a tremendous amount through listening to the faculty discuss their ideas and concerns." Most students reported that this course was one of the best courses they had ever had in their graduate program. Working on an authentic design problem, within a group led by a faculty member made the experience a unique one—one very different from most courses the students had been in before.

The Faculty Experience

Each of the six faculty-led design teams successfully design part or all of a course. Of those six, five have been further refined through the VU process and have been taught.

It was our belief that by participating in the process designing an online course with their team, that the faculty members in this course would produce courses that were far more sensitive to the constraints offered by each component of our model (content, pedagogy, representation, and technology). It's clear that some of these interactions were explored by the faculty participants.

Designing courses for a face-to-face environment was something that all faculty members had a lot of experience with. However, like most experts, firmly established work activities were characterized by automatic routines and tacit knowledge and practices. However, the introduction of a new context for course design, where the rules of face to face teaching do not necessarily apply (the World Wide Web), presented a challenge to established ways of thinking about these activities. It required the development of new procedures, new tools, and new artifacts to represent and teach content in new contexts. The faculty participants quickly realized this and sought new forms of support and collaboration required to support their solutions to these new problems. For example, a major concern of all faculty members was how to engage students with the text online. Faculty used their student group members to test out their ideas and make revisions as needed. One faculty noted,

> "I was shocked because I had… given everybody a sample chapter…. I boxed it, bolded it, the things that I wanted to be salient. They still didn't see it. So that told me it was only when we sat face to face and I said okay, here is a little pretest I'm thinking about, answer that one question and they couldn't. And they didn't even know they'd read it and they didn't even know where it was…. That was a very poignant test for me, it said… we have to think much more carefully about how we're going to signal the students relative to what is really salient here."

However, the struggle was not without merit – the instructors were able, through their experiences in the class, to successfully reconcile these differences between their past teaching experiences and the challenges posed by the new

online environments. That is, they became increasingly sensitive to how the element of technology co-constrained the more familiar elements of representation, pedagogy, and content.

Faculty also developed a broader understanding of technology. Teaching online courses requires a level of familiarity and comfort with technology that many faculty members lacked. Although faculty members were the "content experts" they typically were not the technology experts. Consequently, developing an online course required collaboration with individuals who are experts in technology (the course instructors and knowledgeable graduate students). Accordingly they not only became more knowledgeable about various technologies, their understanding of technology became realistic, and was more likely to inform the relationship between technical decisions and the impact on pedagogy. For example, one faculty member mentioned how the class discussions increased her knowledge of what is possible with technology,

> "I think there were applications I hadn't seen before. I'd seen streaming video but I'd seen how it could be linked… used in a course so I kinda thought about them concretely for the first time. We spent some time almost every week talking about something technical and those were very interesting to me."

Finally, the faculty members benefited from their interaction with the graduate students. The graduate students proved to be a valuable source of ideas. One faculty member said,

> "One of the most challenging and confrontive (sic) groups I ever worked with and that's been very healthy and refreshing. I've confronted them about the way I want to do things and they've confronted me like 'you can't do it that way,' or 'it doesn't make sense to do it that way,' so that's been very refreshing. It hasn't been personal at all, … not challenging in a negative way but it's been stimulating the group process."

Furthermore, by bringing to bear their own experiences as students, and by imaging themselves in the online class they were developing, the graduate students were able to give faculty members feedback about the likely effect the design would have on prospective students. As one faculty member said,

> "Talking through with my team and actually developing those discussions I think It's… going to be simpler and clearer (for students) than I thought at the beginning and one thing that a couple people (in my group) recommended to me is for those discussions, don't leave them open ended. Connect them to a text chapter and have some very focused items or, or questions or focus points for each web talk conversation…. In person in the past I would have tended to be more loose and students kind of pick up indirectly and maybe that's been one of the things that hasn't worked real well for me so that's an example of being very explicit in terms of today, based on this content, we're having this discussion. And so I can carry that over to in-person, that's, that's one of the examples, I think, that'll help those types of things."

All of the faculty members commented on the value of the collaborative process of course design with students. One noted, "I think that was one of the most interesting things is that what was actually produced was largely their (students) work. I mean, they, they actually did the design, the graphics and all that stuff was all their work."

DISCUSSION

The design approach to faculty development has proved to be a fruitful lens for considering the many avenues of professional growth required to enter the world of online teaching and learning. Instead of turning over the

development of their courses to web-programmers, the designers of these courses experienced something quite different. They worked together to design the courses themselves. Along the way, they not only learned new technology skills, they also thoughtfully considered how the technology could be leveraged to accomplish higher-order learning goals for their potential students.

It has always been problematic to draw generalization from case studies of one. At one level all we have here is one classroom, innovative to a certain extent in that it included faculty and students designing online courses. However, we believe that this experience has been a very profitable one in terms of realizing the importance of having technology fluency developed co-jointly with decisions of pedagogy, content, and representation. At the very least, we believe that approach shows what is possible, and worth exploring to see how far it can go, and how broadly it applies. Based upon our experiences, we continue to teach, design and re-design this course to further develop faculty and students towards the challenge of teaching online.

Finally, consider how far some faculty came. Dr. Shaker once said:

> "I don't know a lot about the technical stuff of the computer. I don't feel like I want to know that, or need to know that.... I don't need to know how to compress stuff and, you know, other people can do that. That's not what I wanna do. I don't know how the telephone works either. Nor do I care."

That was then… and now?

> "Dr. Shaker's been changing with that stuff (sic) all semester and it's great, it's been nice to watch when she first started she just changed text, now she puts in links, she adds papers up to the server and then links to them, she changes different html things … one of the things that she does is she records her weekly feedback to the students and then converts that to a real audio and puts it on the server… she doesn't have to bother about sending it to me and then worrying whether I did it right or not and she can also do it while she's on vacation or what ever." – (Mr. Ott, Dr. Shaker's Producer at VU)

> "My goal was to really give myself, force myself the luxury of thinking critically about teaching in, in this format and in any other format. That was really a luxury of the course and that's what I wanted and that's what I got. I made that happen for myself." – Dr. Shaker.

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Appendix A

1. Can you tell me a little bit about yourself (name, background).

2. Do you enjoy teaching, why?

3. How do you see your role as a teacher?

4. How do you think people learn?

5. Can you tell me a little bit about your previous experience with using computers <general experience follow up: what do you use computers for in your everyday life?>

6. What is the role of technology in your teaching? <Can you tell me a little bit about how you have used computers in your teaching? Do you think technology changes the way you teach? In what way?>

7. What experiences in online education have you had prior to taking this course?

8. Can you describe the online course that you are currently developing? <have you taught this before? Face to face? When do you plan to teach this course?>

9. Imagine that you have taught this course both face to face and online. How do you think this course would differ if taught face to face versus online?

   Prompts in these areas:

   interaction with students
   generating substantive discussions
   participation
   getting to know your students
   personal relationships with students
   kinds of students

   amount of work for faculty and students
   instructor anxiety for the course
   faculty role
   having documentation of student performance and activity
   motivating students

   having to deal with technology
   flexibility
   understanding student knowledge
   monitoring student engagement and learning
   student assessment

10. What were your greatest concerns about teaching this course?

11. Can you briefly describe how you would go about designing a regular face to face course?

12. How is this different from what you are doing now? <i.e., designing an online course.>

13. How much do you feel in control of what is happening when you are designing this online course?

14. What would you do differently if you had to do this over again? <what are the lessons learnt?>

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15. Can you describe how your group worked while developing this online course?

    How were roles assigned in your group? <why do you think it came out that way?>
    What was your role in the group?
    How did your group make decisions?
    How did your group use technology to interact with each other?

16. Did the people with prior technical expertise influence the development of this course <content, design, decision-making: give examples.>

17. Has your understanding of the content you are to teach changed as a consequence of developing this online course? <has developing this course changed the way you think about key concepts, changing emphasis due to change in medium, changes in organization of content.>

18. Did your goals and concepts about content change over time? How?>

19. Have you had to backtrack yet to redo something? Why? Was there a way to avoid it? <to redo something because you have found it to be cumbersome, unsuited to your task, or it limited your options? <how did you come to the conclusion that you had to change that?>

20. What were your expectations about the faculty development course that you are in right now? <how has this work out?>

21. What have you learned? <specifically about technology, about design?>

22. What would you do to improve the faculty development course if it were to be offered again?

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Appendix B – Student Survey

[Instructions omitted]

Simply hit "reply" to this email and type in your answers after each of the questions.

1. Your name:

2. Year:

3. Major:

4. What were your expectations about CEP 882 the first day of class?

5. To what extent were your expectations met (or not met)?

6. Describe how your group worked while developing this online course. In particular, address issues such as:

- How were roles assigned in your group?
- Did you have a voice in this decision?
- What was your role in the group?
- How much of your group work was controlled by the "techies"?

7. What did you learn in this course? (Please be as specific as you can, offer names of software, concepts, and ideas in the areas below.)

- About technology:
- About web page design:
- About designing online courses:

8. Knowing what you know now, what things would you do differently if you could go back in time and take CEP 882 all over again as a student?

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